AF

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 09/854,153

Filed: May 11, 2001

Inventor(s): Newell, et al.

Title: Channel Gain Control For An Optical Communications System Utilizing Frequency Division Multiplexing

Examiner: Bello, Augustin
Group/Art Unit: 2633
Atty. Dkt. No: 5957-41409

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to M/S AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

Rory D. Rankin
Registered Representative

Signature

February 24, 2006
Date

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request. This request is being filed with a notice of appeal. The review is requested for the reason(s) below. Applicant is in receipt of the Advisory Action mailed January 24, 2006. Claims 1-12 remain pending in the application. Reconsideration of the present case is earnestly requested in light of the following remarks. Claims 1-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Bodell (U.S. Patent No. 4,768,186). The following clear errors in the Examiner's rejection are noted.

Generally speaking, Applicant's currently claimed invention is directed to a system and method that adjusts the gain of an optical communications system on a channel-by-channel basis to compensate for dispersion. In contrast, Bodell is directed to monitoring conditions along a communication path and improving the signal-to-noise ratio via preemphasis and deemphasis of signals. Applicant's currently pending claim 1 recites:

"In an optical fiber communications system including an optical fiber, a method for compensating for dispersion effects in the optical fiber, the method comprising:

receiving at least two low-speed channels, each low-speed channel allocated a different frequency band of an optical fiber communications system for transmission across the communications system;

for each low-speed channel, estimating attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel;

adjusting a power of each low-speed channel to compensate for the estimated attenuation caused by dispersion; and

frequency division multiplexing the power-adjusted low-speed channels to produce an electrical high-speed channel for transmission across the communications system."

As seen from the above, claim 1 includes the features (1) estimating attenuation caused by dispersion, and (2) adjusting a power of each low-speed channel to compensate for the estimated attenuation caused by dispersion. In the Office Action of September 20, 2005, paragraph 3, the examiner states that:

> "Bodell appears to suggest estimating the attenuation of the communication system via a pilot carrier signal for monitoring, adjustment, and alarm purposes (column 2 lines 43-49). Furthermore, Bodell teaches that the powers of certain frequencies are improved, thereby compensating for losses experienced by certain frequencies (column 6 lines 1-23). One skilled in the art would have been motivated to estimate the attenuation of the communications system for each of the low-speed channels in order to compensate for the attenuation presented to certain channels as suggested by Bodell. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to estimate the attenuation of the communications system for each low-speed channels and compensate for the estimated attenuation of the communications system via adjustment of the power of each low-speed channel."

However, Applicant submits Bodell does not suggest the above features and it would not have been obvious to one skilled in the art at the time the invention was made to modify the teachings of Bodell as stated. If the Examiner is suggesting that the pilot carrier signal could be used to estimate the attenuation caused by dispersion for each channel, Applicant disagrees and submits that Bodell's pilot carrier signal is not suitable for doing so. Applicant finds no teaching or suggestion in Bodell that the pilot carrier signal comprises signals at more than one frequency. A "pilot carrier signal" suggests a signal transmitted on a particular carrier frequency. In order to estimate dispersion that may vary among each of the low-speed channels (e.g., chromatic dispersion), the pilot carrier signal would have to be able to separately measure attenuation at each of the frequency bands allocated for each low-speed channel. Such estimation is neither taught nor suggested by Bodell's pilot carrier signal. Rather Bodell teaches that the pilot carrier signal is used "for monitoring purposes, e.g. to indicate whether a multiplexer is not functioning or no modulating signals are being processed." (Bodell, column 3, lines 33-35). Further, Bodell teaches the disclosed pilot tone signals may be used "for remote monitoring of conditions at an unmanned station." (Bodell, Abstract). Applicant submits these teachings do not suggest estimating attenuation caused by dispersion and adjusting power of each low-speed channel to compensate for such attenuation caused by dispersion as recited.

Also, Bodell teaches that "Pilot tone signal information of the detector-demodulator 29 is supplied to an automatic gain control driver 30 which, as indicated schematically by the variable resistors 31, 32 and 33, controls the gain through the amplifiers 21-23 in accordance with the amplitude of the pilot tone signal." (Bodell, column 4, lines 32-37). However, this teaching refers to controlling the overall gain of all channels collectively, rather than to relative gain between channels. Therefore, Bodell does not suggest the above features, and one skilled in the art at the time the invention was made would not have been motivated to estimate attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel using Bodell's pilot carrier signal.

In addition to the above, Bodell discloses means for adjusting the emphasis of different frequencies via a preemphasizer that is paired with a deemphasizer. More specifically, Bodell discloses:

> "As a further means for improving the quality of signal transmission, a preemphasizer 55 and 55a may be included intermediate the source of amplitude modulated, multiplexed signals, such as the master group multiplexer 6, and the FM modulator 7 and 7a for emphasizing certain frequencies and thereby improving the power transmitted at such frequencies and hence, the signal-to-noise ratio. Of course, when such a preemphasizer, 55 and 55a, is used, the signals are subjected to deemphasis at the receiving end, such as by the deemphasizers 56 and 56a. A typical preemphasis graph for the frequency range from 123.56 KHz to 6178 KHz is illustrated in FIG. 5. **The deemphasis graph would be the inverse of what is shown in FIG. 5.**" (Bodell, column 6, lines 1-15, emphasis added).

Therefore, the deemphasizer is the inverse of the preemphasizer. Consequently, any other changes to the signal amplitude not introduced by the preemphasizer (such as from dispersion) are not compensated. In effect, Bodell teaches away from compensating for attenuation caused by dispersion since such attenuation would cause Bodell's emphasizer and deemphasizer to be mis-matched. Bodell's paired emphasizer-deemphasizer is generally directed to improving the signal-to-noise ratio. For example, if a given frequency is subject to a higher noise level during transmission than other frequencies, preemphasizing the given frequency prior to transmission and deemphasizing it after transmission may improve the signal-to-noise ratio of the given frequency. Compensating for noise is entirely different from compensating for attenuation. Therefore, Bodell does not suggest adjusting a power of each low-speed channel to compensate for the estimated attenuation caused by dispersion since the paired emphasizer-deemphasizer is not suitable for compensating for such attenuation.

In summary, Applicant finds no teaching or suggestion in Bodell of, for each low-speed channel, estimating attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel and adjusting a power of each low-speed channel to compensate for the estimated attenuation caused by dispersion. Accordingly, Applicant submits that claim 1 is patentably distinguishable from the cited art for at least the above reasons. As independent claim 7

includes limitations similar to those of claim 1, claim 7 is believed patentably distinguishable from the cited art for similar reasons. Likewise, each of dependent claims 2-6 and 8-12 are believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above, the features of claims 2 and 8 wherein the step of adjusting a power of each low-speed channel comprises applying "a gain to each low-speed channel which is equal in magnitude to the estimated attenuation for that low-speed channel" are not disclosed by the cited art. In the Office Action of September 20, 2005 (page 3, paragraph 2), the examiner suggests that these features would have been obvious to one skilled in the art at the time the invention was made, given the teachings of Bodell. However, since Bodell's pilot carrier signal is not suitable to estimate attenuation caused by dispersion for each channel and Bodell's paired emphasizer-deemphasizer is not suitable for compensating for attenuation within each channel, Bodell neither discloses nor suggests these features. Accordingly, Applicant submits that claims 2 and 8 are patentably distinguishable from the cited art for at least these additional reasons. Likewise, each of dependent claims 3 and 9 are believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above, the features of claims 5 and 11 wherein the step of estimating an attenuation caused by dispersion comprises estimating an "attenuation caused by chromatic dispersion" are not taught or suggested by the cited art. In the Office Action of September 20, 2005 (page 4, paragraph 4), the examiner states that

> "Regarding claims 5, 6, 11, and 12 Bodell . . . fails specifically to teach . . . estimating a gain due to chromatic dispersion or polarization mode dispersion for the frequency band allocated to the low-speed channel. However, since the system of Bodell propagates a pilot signal which monitors the various characteristics of the transmission system and makes adjustments based on the measurements (column 2 lines 42-49), one skilled in the art clearly would have recognized that gain due to chromatic dispersion and polarization mode dispersion would have also been measured by the pilot signal, and power measurements made based on the measurements. Furthermore, Bodell's main objective in propagating the pilot signal is to improve the quality of the signal transmission via adjustments made to certain frequencies based on monitoring results. One skilled in the art would have been motivated to measure chromatic dispersion or polarization mode dispersion for the frequency band allocated to the low-speed channel in order to improve the quality of signal transmission. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to measure the chromatic dispersion or polarization mode dispersion for the frequency band allocated to the low-speed channel in order to estimate the gain of the communication system."

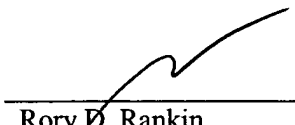
However, as noted above, Bodell's pilot carrier signal is not suitable to estimate, for each channel, attenuation caused by dispersion and, in particular, chromatic dispersion. Chromatic dispersion varies from frequency to frequency and Bodell fails to teach that the pilot carrier signal comprises signals at more than one frequency. Accordingly, Applicant finds no teaching or suggestion in Bodell of estimating the attenuation caused by chromatic dispersion. Further, it is noted that the examiner's statement that "Bodell's main objective

in propagating the pilot signal is to improve the quality of the signal transmission via adjustments made to certain frequencies based on monitoring results" does not include a supporting citation to Bodell. Bodell merely discloses that the system may include a pilot tone signal "for remote monitoring of conditions at an unmanned station", "for monitoring, adjustment, and alarm purposes", and "for monitoring purposes, e.g. to indicate whether a multiplexer is not functioning or no modulating signals are being processed." Applicant submits such disclosures are in no way equivalent to the "main objective" of the pilot signal as stated by the examiner, and no such "main objective" is disclosed. For at least these additional reasons, claims 5 and 11 are patentably distinguishable from the cited art.

In light of the foregoing, Applicant submits the application is in condition for allowance, and notice to that effect is respectfully requested. If any extension of time (under 37 C.F.R. § 1.136) is necessary to prevent the above referenced application from becoming abandoned, Applicant hereby petitions for such an extension. If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert & Goetzel PC Deposit Account No. 501505/5957-41409/RDR. Also enclosed herewith are the following items:

☒ Return Receipt Postcard
☒ Notice of Appeal
☒ Petition for Extension of Time
☒ Fee Authorization

Respectfully submitted,



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